

# THE QUANTITY THEORY TRADITION AND THE ROLE OF MONETARY POLICY

*Robert L. Hetzel\**

**Introduction** Currently, there is an intense debate within the economics profession over the extent of the role that the central bank should play in the economy. One view, with intellectual roots in the work of nineteenth and early twentieth century "quantity theorists," favors a limited role for the central bank with two-fold objectives. One objective is achievement of a stable price level. Knut Wicksell, a Swedish economist, could write at the turn of the century, "The establishment of a greater, and if possible absolute, stability in the value of money has thus become one of the most important practical objectives of political economy."<sup>1</sup> Another objective is to ensure that the actions of the central bank do not themselves become a source of economic instability. Wicksell referred to this possibility in the following quote. "By means of money (for example by State paper money) it is possible—and indeed this has frequently happened—to destroy large amounts of real capital and to bring the whole economic life of society into hopeless confusion."<sup>2</sup> The ideas associated with the "quantity theory of money" are reviewed in the following sections. A final section presents evidence in graphical form that is often used to support quantity theory ideas.<sup>3</sup>

**Quantity Theory** In order to understand the quantity theory of money, it is necessary to start with a definition and an analytical distinction. "Money" in popular parlance is used in three senses. It can mean income, credit, or the currency and transactions balances held by the public at financial institutions. It is the last definition that is used in the expression "the quantity theory of money." The

analytical distinction is between "nominal" and "real" quantities. Nominal quantities are measured in dollars; real quantities are measured independently of dollars. The nominal quantity of money one holds is simply the number of dollars of currency and transactions balances he has. The real quantity of money one holds is the amount of goods and services that this nominal quantity will purchase. The price level, typically, is expressed as the number of dollars required to purchase a specified basket of goods and services. The price level, or its reciprocal, then translates a given nominal quantity of money into a real quantity. It is their real, not nominal, money balances that individuals care about.

The flavor of quantity-theory thinking is conveyed by two assumptions. One is that the public's demand for real money holdings is "stable." The other is that the monetary authority determines the nominal money holdings of the public, and then the public determines the real value of these nominal money holdings as a consequence of variations in the price level due to its (the public's) spending behavior. At the existing price level, the given nominal quantity of money determines an actual quantity of real money balances. A discrepancy between these actual real money balances and the real money balances desired by the public causes the public to alter the rate at which it spends. These alterations in the expenditure of the public cause the price level to change in a way that eliminates the discrepancy between actual and desired money balances.

From this perspective, the price of money is the reciprocal of the price level. (The reciprocal of the price level measures units of a standardized basket of commodities per dollar.) A change in the quantity of money (or its rate of growth) may affect variables such as the real (inflation-adjusted) rate of interest and real income, but the effect is transitory. It is not these changes, but rather the change in the price level that reestablishes the equilibrium relationship of equality between the actual and the desired real money holdings of the public. A given percentage increase (decrease) in the quantity of money will

\*The author is a Research Officer at the Federal Reserve Bank of Richmond.

<sup>1</sup> Wicksell [8; pp. 7, 8].

<sup>2</sup> Wicksell [8; p. 6].

<sup>3</sup> The exposition of quantity theory ideas draws on Milton Friedman [3, 4, and 5]. The discussion of money and interest rates follows Milton Friedman [2].

cause the same percentage increase (decrease) in the price level. The price of money will fall (rise).<sup>4</sup>

The price level is determined by the interaction between the demand for and the supply of money. One implication of the assumed stability of the public's demand for money is that, as an empirical matter, changes in the supply of real money balances (caused by changes in the nominal quantity of money valued at the existing price level) are large relative to changes in the public's demand for real money balances. As a consequence, the price level, or inflation rate, can be explained primarily by reference to the supply side, that is, by the behavior of the money supply. This assumption is summarized by saying that "inflation is a monetary phenomenon."

The assumptions of the quantity theory are illustrated in Milton Friedman's illustration of a helicopter drop of money from the sky. (The helicopter corresponds to the assumption that the monetary authority controls the nominal quantity of money and that monetary disturbances arise from the actions of the monetary authority, not the private sector.) After

<sup>4</sup> These ideas can be expressed by reference to the "equation of exchange" in its cash-balances formulation:

$$(1) \quad M = k(i) \cdot P \cdot y.$$

M is money, P is the price level, and y is real income. The symbol k represents the public's demand for real money balances, expressed as the fraction of a year's nominal income the public desires to hold in the form of nominal cash balances. The demand for real money balances is shown as depending on the rate of interest, i. The equation of exchange can be rewritten as follows:

$$(2) \quad \left(\frac{M}{P}\right)_s = (k(i) \cdot y)_d.$$

Given M, the nominal quantity of money, the left-hand side represents the supply of real money balances and the right-hand side represents the public's demand for real money balances. The two sides are equated by changes in the price level, P.

Quantity theorists differ with non-quantity theorists with respect to how the two sides of (2) are equated. Consider the statement, made only by non-quantity theorists, that increases (or high rates of growth) of the money supply are not inflationary in a recession. The public, it is argued, will adjust to the increased supply of real money balances by an increased demand (represented by the right-hand side of (2)). The increased demand will derive from a fall in the interest rate, i, and a rise in real income, y.

Quantity theorists argue that the above statement, about the absence of inflationary consequences due to an increase in the money supply effected during a recession, is misleading. The existence of a recession may retard the inflationary consequences of an increase in the money supply. An increase of, say, 10 percent in the money supply from a given level, however, will ultimately produce a price level 10 percent higher than if the money supply had been kept at its original level, regardless of whether the increase occurred during a recession. From the quantity-theory perspective, in which the price of money is the reciprocal of the price level, an increase in the money supply must ultimately cause an equiproportionate rise in the price level. Otherwise, the demand for money is unstable.

Individuals have gathered up the fallen money, they will try to reduce their money holdings to their original level by spending more than they receive. Individuals taken collectively, however, cannot spend more dollars than they receive. The public cannot reduce its increased holdings of nominal money. What the public will do is increase the rate at which it spends. The increased rate of expenditure will cause prices to rise. The surplus money holdings are eliminated, not through a reduction in the nominal quantity of money, but rather through a reduction in the real quantity of money caused by the rise in the price level. The rise in the price level returns the real money holdings of the public to their original level.

Because of its control over the nominal quantity of money, the monetary authority influences the rate at which the public spends. For example, in the helicopter illustration, an increased quantity of money causes the public to spend at a faster rate.<sup>5</sup> Quantity theorists like Irving Fisher made the relationship between money and the expenditure of the public into a monetary explanation of the business cycle. Consider a decrease in the quantity of money. The public, in an attempt to restore its money holdings to their original level, will reduce the rate at which it spends. Producers respond initially to the reduced spending on their output by reducing output and employment. In time, the price level falls and the spending of the public expressed in real terms, that is in terms of purchasing power, returns to its original level. A recession persists over the interval of time required for the price level to fall sufficiently to restore the real money balances and the real spending of the public to their original levels. The assumed stability of the public's demand for money implies that the changes in the expenditure of the public that generate the business cycle originate with changes in the supply of money, not with changes in the demand for money.

<sup>5</sup> The relationship between nominal money balances and the rate of nominal expenditure by the public is formalized in the transactions version of the equation of exchange:

$$(3) \quad M \cdot V(i) = P \cdot y.$$

The right-hand side of (3) is nominal, or current-dollar, income, say, net national product. V, or velocity, is the reciprocal of the k defined in (1). It defines the rate at which the quantity of money turns over against nominal income. The velocity of money is one way of measuring the public's demand for money, and quantity theorists emphasize its stability. M times V, the left-hand side of (3), is the rate at which the public spends, measured in nominal, or current-dollar, terms. The assumption that V does not change in a way that offsets the effect of changes in M (apart from short-lived intervals of time) implies that the rate of nominal expenditure by the public is determined by M, the money supply.

**Money and Interest Rates** Economists differentiate among three effects of an increase of the money supply on interest rates. The first effect is the liquidity effect. An increase in the supply of money will cause asset holders to try to rearrange their portfolios in an attempt to move out of money into other assets. The result is to bid up the prices of these other assets and to depress interest rates. The second effect is the income effect. The increased supply of money increases the rate at which the public spends. The initial, stimulative impact on output increases credit demands. The second effect raises interest rates. The final effect concerns the inflation premium the public builds into interest rates. The increased supply of money will cause the price level to rise. If the public comes to anticipate increased inflation, it will increase the inflation premium built into interest rates in order to preserve the real, or inflation-adjusted, rate of return on bonds. Economists of a quantity theory persuasion emphasize, as an empirical matter, the importance of the last two effects. They argue that, in fact, high rates of growth of the money supply are associated with high, not low interest rates.

**Policy Implications** The quantity theory of money yields only a small number of implications for policy, but these implications are important. The most obvious implication is that control of the money stock is the key to controlling inflation. Another implication is that the behavior of the money supply is the best measure of the impact of monetary policy on the economy. This implication is important because in the past the monetary authority has used other guides for the conduct of monetary policy, in particular, conditions in the credit markets. For example, the low level of interest rates in the Great Depression was at the time viewed as evidence that monetary policy was easy. As measured by the behavior of the money supply, however, monetary policy was extremely restrictive. A final implication is that over long periods of time the rate of growth of the money supply has no direct effect on the rate of growth of real income or on the real (inflation-adjusted) rate of interest.<sup>6</sup>

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<sup>6</sup> There may, of course, be indirect effects deriving from institutional considerations such as specification of the tax code in nominal, rather than in inflation-adjusted, terms; price fixing by the government in nominal rather than in real terms; political pressure for wage and price controls; and so on. There will also be a second-order effect in that the public will hold smaller real money balances and thus will enjoy fewer services from their money balances.

The research of Milton Friedman and Anna Schwartz has given additional empirical content to the quantity theory and has produced additional implications for policy.<sup>7</sup> The results of their study of the cyclical relationship between money and economic activity are consistent with the hypothesis that, in general, cyclical instability originates with the behavior of the money supply. Friedman concludes that steady growth of the money supply will eliminate most major cyclical fluctuations in economic activity.<sup>8</sup> Friedman and Schwartz also contend that the relationship between money and nominal income (or the expenditure of the public) is predictable only over lengthy intervals of time or as an average of many particular instances over shorter intervals of time. For example, a discrete change in the percentage growth of the money supply will produce the same change in the percentage growth of nominal income, but only with a lag that is usually long and, in particular instances, variable.

Friedman concludes that monetary policy is not a suitable instrument for offsetting fluctuations in nominal income.<sup>8</sup> The length of the lag referred to above requires that economic activity be forecast for a considerable period into the future in order for monetary policy to be used as a countercyclical tool. The variability of the lag also requires that the length of the lag be forecast in the specific instances in which monetary policy is to be used as a countercyclical tool. Friedman argues that the difficulty of forecasting the future behavior of the economy and the timing of the effect of monetary policy in particular instances means that an actively countercyclical monetary policy could destabilize, rather than stabilize, the economy.

**Graphical Evidence** Four charts are presented below that summarize relationships discussed above. The first chart summarizes the central relationship between money and the price level. It shows a plot of quarterly observations of the inflation rate, as measured by percentage changes over past four-quarter intervals of the GNP deflator. It also shows quarterly observations of the rate of growth of the money supply, also measured by percentage changes over past four-quarter intervals. The latter observations correspond not to the date at which they are plotted, but rather to the date seven quarters earlier. In the jargon of economists, the rate of growth of the

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<sup>7</sup> Friedman and Schwartz [6].

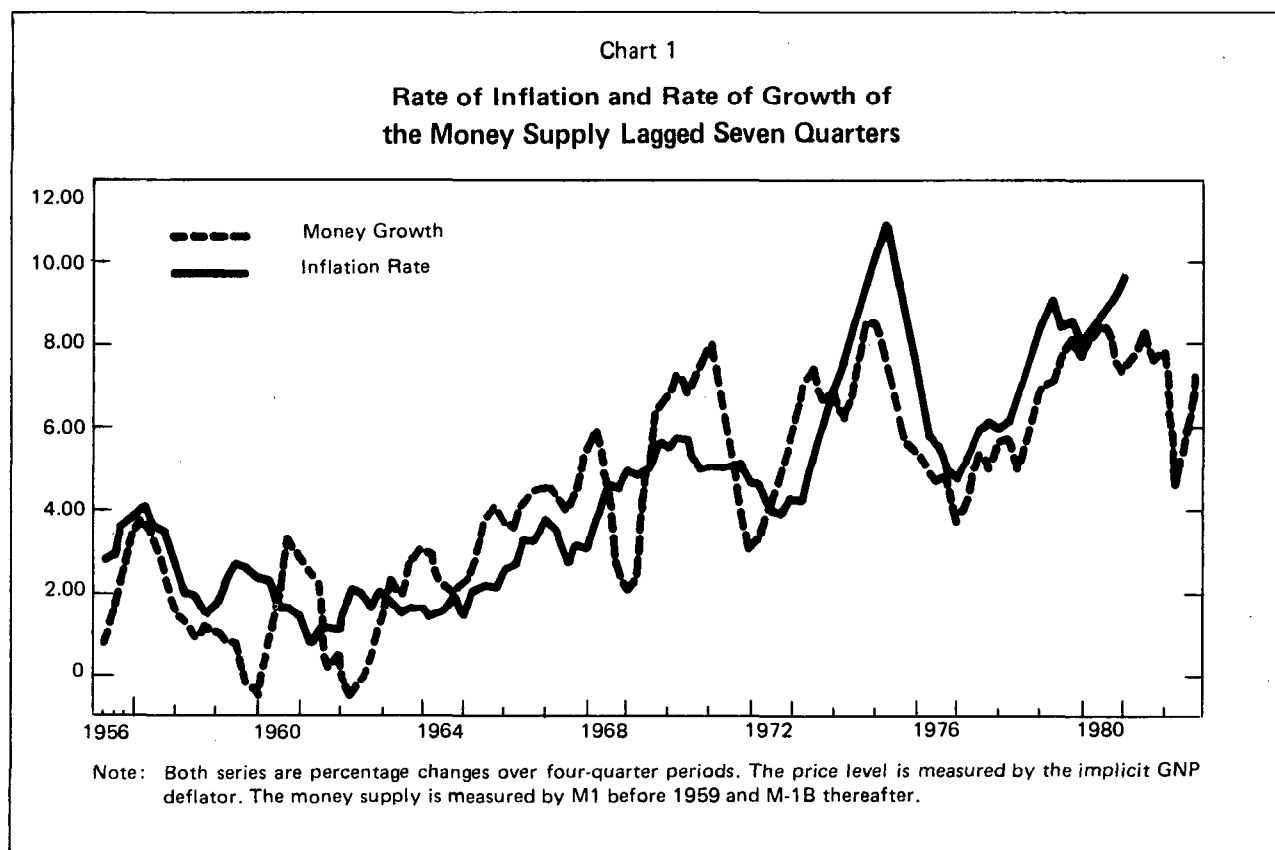
<sup>8</sup> Friedman [1].

money supply series is lagged seven quarters.<sup>9</sup> The rate of growth of the money supply determines the rate of inflation with a long, distributed lag. In the United States in the post-Korean War period, the bulk of the effect has come with about a two-year lag.

An examination of Chart 1 suggests several comments. First, and most important, the rate of growth of the money supply does predict broad movements of the inflation rate. Second, the level of the rate of growth of the money supply and the level of the rate of inflation are about equal for the whole period, 1956 to 1980. This result was produced by the cancelling of two effects. On the one hand, the velocity of money, the rate at which money turns over against nominal income, increased at a trend rate of about three percent. (Each year, on average, the public figured out how to support a given amount of nominal expenditure with about three percent less cash.) On the other hand, real GNP increased at a trend rate of about three percent. The first effect raised and the second effect lowered the rate of inflation relative to the rate of growth of the money supply.

<sup>9</sup> The seven-quarter lag was chosen by a visual inspection of the two series. The money supply is measured by M-1B after 1959 and M1 before 1959.

Third, from the early 1960s through the early 1970s, the rate of growth of money generally exceeded the inflation rate; thereafter, the inflation rate generally exceeded the rate of growth of money. An explanation of this reversal can emphasize either the relative strength of the demand for real money balances in the former period, or the relative weakness of demand in the latter period. An explanation of the first kind is that the strong, practically cycle-free growth of the 1960s caused the public to reassess in an optimistic direction prospects for the future growth of the economy and, consequently, estimates of its wealth. Assuming that the demand by the public for real money balances depends upon the public's estimate of its wealth, such an optimistic reassessment of its wealth could have caused the relative strength in the public's demand for real money balances. An explanation of the second kind is that the high level of nominal interest rates in the 1970s spurred corporations to introduce cash-management techniques and spurred financial institutions to introduce new monetary liabilities. Such developments could have caused the relative weakness in the public's demand for real money balances.



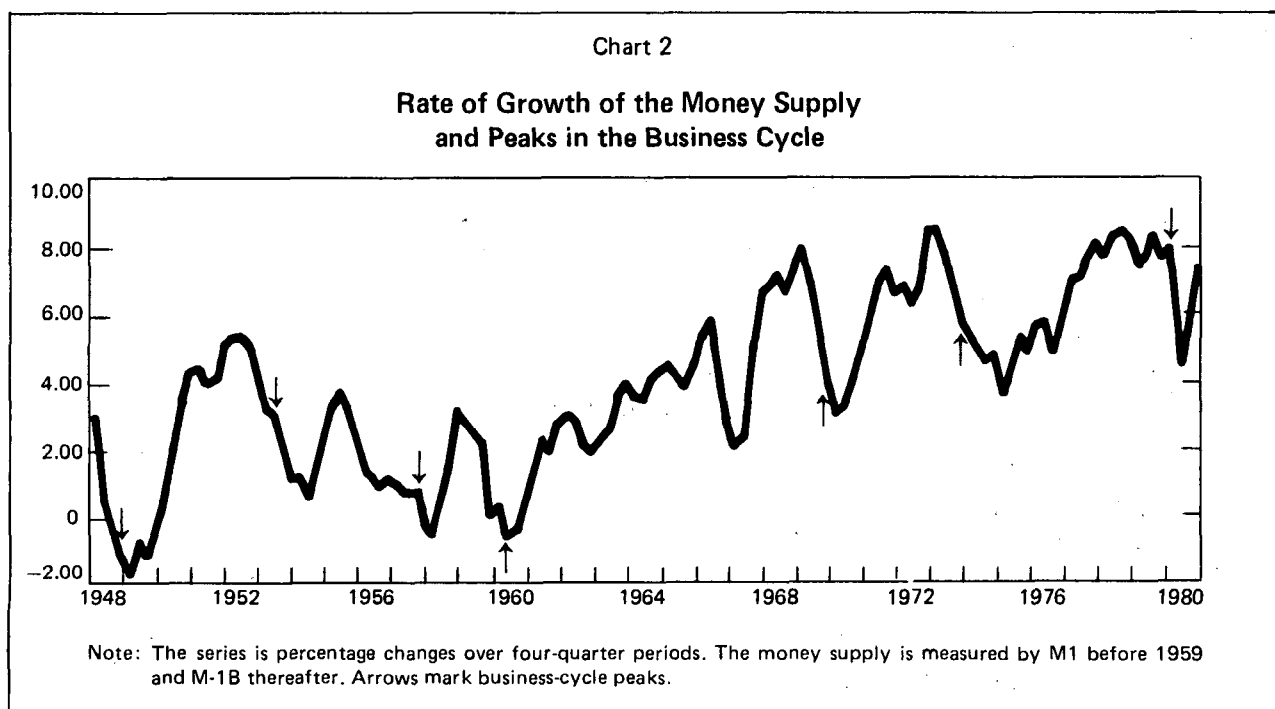
Fourth, past, not current, rates of growth of the money supply are the better predictor of the current inflation rate. This temporal relationship is consistent with the view that it is the rate of growth of the money supply that causes the inflation rate. This relationship is inconsistent with the various institutional theories of inflation. Such theories argue variously that inflation is produced as a consequence of competition among social groups for incompatibly large slices of national income, as a consequence of the greed of corporations or labor unions, or as a consequence of an ever-changing number of special, ad hoc factors like bad harvests and oil price increases. Institutional theories of inflation possess the common characteristic that the monetary authority must "finance" the price level that arises independently of its actions by providing increases in the quantity of money proportional to increases in the price level. Institutional theories of inflation, therefore, require that the movements in money and price series correlate positively either on a contemporaneous basis or with money lagging prices.<sup>10</sup>

<sup>10</sup> Actually, institutional "theories" of inflation are not theories in the sense of the word as used by economists. These theories do not yield predictions of the rate of inflation that can, subsequently, be verified or falsified. They provide only after-the-fact rationalizations of observed rates of inflation.

Fifth, over the entire period from 1956 through 1980, the rate of inflation rises, consistent with the rise in the rate of growth of the money supply. The rate of inflation, however, is not flexible in only one direction. Reductions in the rate of growth of the money supply produce reductions in the rate of inflation. As shown in Chart 1, the most dramatic example is the fall in the rate of inflation over the two-year period beginning in 1975.

Finally, based upon the experience of the last five years, Chart 1 indicates that the rate of growth of the money supply (as measured by M-1B) that is compatible with price stability is about minus three-quarters of a percent per year. Chart 1 also indicates that, over the next two years, four-quarter inflation rates, as measured by the GNP deflator, are likely to decline from their recent level of 10 percent to 9 and then 8 percent.

Chart 2 exhibits quarterly observations of four-quarter percentage changes in the money supply (as defined in Chart 1). Arrows mark peaks in the business cycle (as demarcated by the National Bureau of Economic Research). Although the length of the lead time is variable and occasionally quite long, business-cycle peaks are preceded by peaks in the money-growth series. This relationship is consistent with the hypothesis that monetary decelerations cause recessions. The exception is the peak



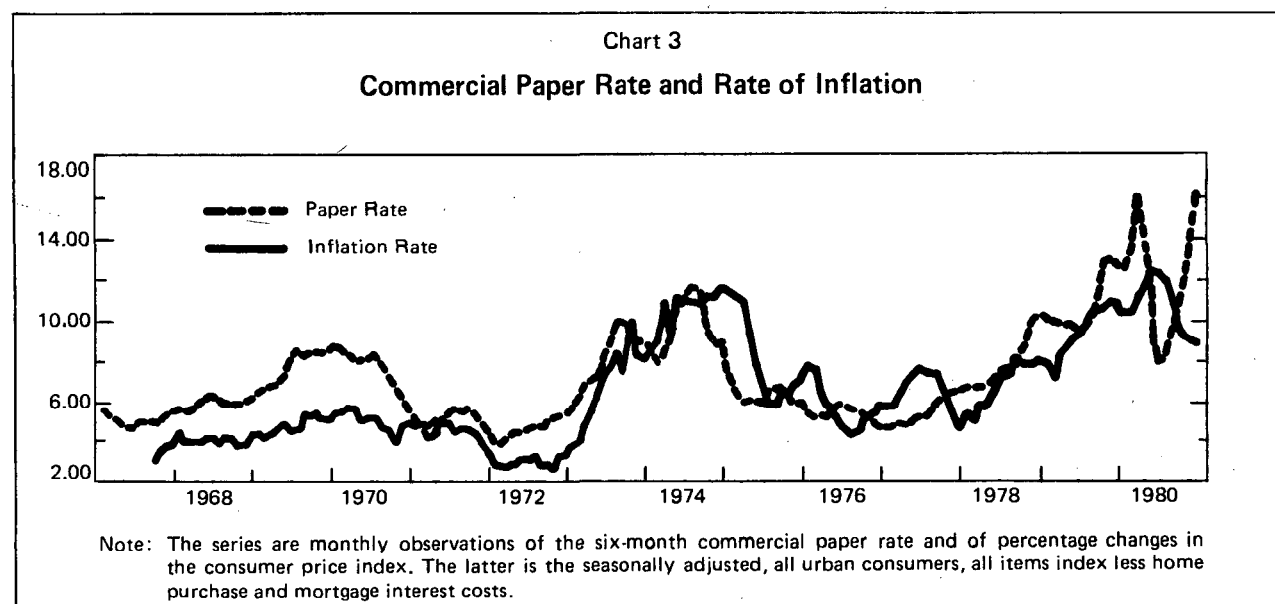
of the current business cycle, the first quarter of 1980. It was not preceded by any prior slowdown in the rate of growth of the money supply. This fact suggests that the current recession is due to non-monetary causes.

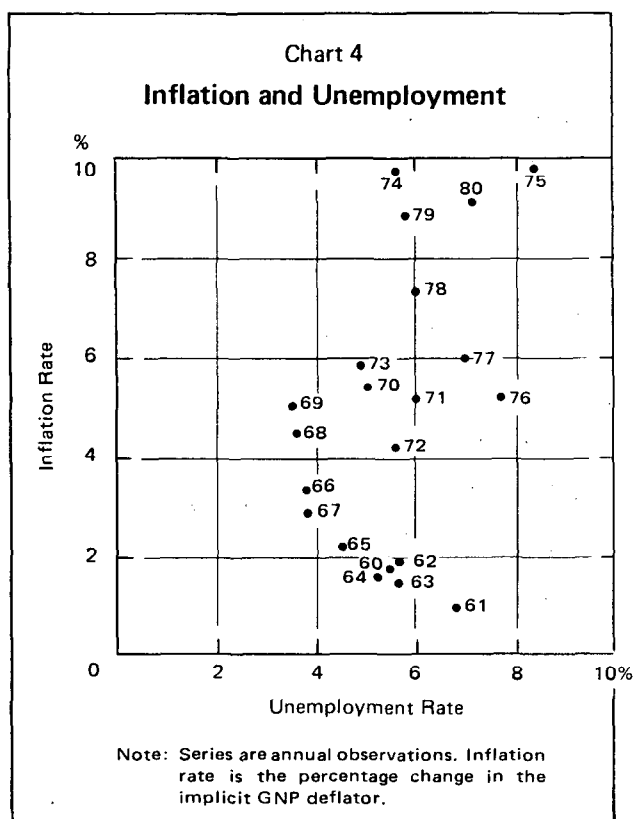
The discussion above of money and interest rates stressed the positive relation between the rate of growth of the money supply and the level of interest rates produced as a consequence of the effect of money growth on the public's expectations of inflation. Chart 3 displays monthly observations of the six-month commercial paper rate and the annualized percentage change in the consumer price index over past six-month intervals.<sup>11</sup> The inflation rate that influences the rate of interest is the one that the public anticipates will occur over future, not past, six-month intervals. The past inflation rate is used here as a proxy for the inflation rate that the public anticipated would occur in the future. Market rates do not move in lock step with inflation rates. For example, for almost a four-year period beginning in 1974, the customary positive differential between the rate of interest on money-market instruments and the rate of inflation practically disappeared. Perhaps the

pervasive uncertainty of the economic environment at this time caused investors to place a high enough premium on remaining liquid that they were willing to forego positive real rates of return. Alternatively, investors might have regularly underestimated the future rate of inflation. Short-term interest rates fell in the middle of 1974, in advance of the fall in the inflation rate, due to the sharp drop off in economic activity. More recently, short-term interest rates rose, fell, and then rose sharply. These movements were dominated by changes in expectations about the cyclical behavior of the economy, the government deficit, the Special Credit Restraint Program, and the shifts between long- and short-term financing of corporations. The broad movements in the inflation and interest rate series shown in Chart 3 are, nevertheless, similar. This broad correspondence is consistent with the hypothesis that high rates of growth of the money supply cause high rates of inflation and, consequently, high (nominal) rates of interest.

Chart 4 deals with the ability of the monetary authority to influence the behavior of real variables (such as output and employment), as well as nominal variables. Standard theorizing along quantity-theory lines has emphasized that the ability of the monetary authority to influence the behavior of real variables is transitory. For example, the monetary authority can increase the money supply in order to increase the rate of spending by the public. At first, producers may respond by working harder and producing more; real income will rise. Producers, however, will raise prices in the face of a persis-

<sup>11</sup> The CPI used is the seasonally-adjusted all urban consumers index, minus home purchase and mortgage costs. The graph using the CPI including home purchase and mortgage costs possesses a very similar appearance. The CPI series is lagged two months in order to take account of the two-month lag in its publication. For example, the observation on a January corresponds to the percentage change in the CPI over the six-month period ending in November of the previous year. For most of January, the November CPI figure is the most recent figure available.





tently higher level of demand, and, in time, the increase in money will be matched by an increase in the price level. Nominal magnitudes, that is dollar-denominated magnitudes, will rise, but real magnitudes, such as output, will return to their original levels. John Stuart Mill, in 1833, emphasized the transitoriness of the ability of the monetary authority to stimulate output. (Mill was criticizing Thomas Attwood who had argued that the money supply should be manipulated in order to maintain a high level of employment.)

Mr. Attwood opines, that the multiplication of the circulating medium, and the consequent diminution of its value, do not merely diminish the pressure of taxes and debts, and other fixed charges, but give employment to labor, and that to an indefinite extent. . . . Mr. Attwood's error is that of supposing that a depreciation of the currency really increases the demand for all articles, and consequently their production, because, under some circumstances, it may create a false opinion of an increase of demand; which false opinion leads, as the reality would do, to an increase of production, followed, however, by a fatal revulsion as soon as the delusion ceases.<sup>12</sup>

<sup>12</sup> This quote is reprinted in [7; p. 14]. Mill was talking about changes in the price level while current debates talk about changes in the rate of change of the price level.

In the above quotation, Mill points out that producers face the task of distinguishing between two types of change in demand. One type is a change particular to individual producers. This type of demand change calls for some combination of a change in price and output. The other type of demand change, associated with changes in the money supply, affects all producers. The latter type of demand change calls for a price change exclusively. Monetary policy cannot be persistently stimulative because in time producers distinguish between these two types of changes in demand.

Current theorizing in the quantity theory tradition assumes that producers of goods and services form their expectations about the future in a rational way. In forming expectations, producers make efficient use of information. In particular, they take account of the behavior of the monetary authority and of how this behavior affects the economy. Monetary policy cannot be persistently stimulative because rationally-formed expectations will cause producers to anticipate the variations in aggregate demand caused by manipulation of the money supply. Producers will respond to such variations by changing prices, not output.<sup>13</sup>

Exponents of the ideas expressed above point to evidence such as is contained in Chart 4. Chart 4 plots annual observations of the unemployment rate (horizontal axis) against the inflation rate (vertical axis). In the 1960s, stimulative monetary policy did produce low rates of unemployment. The observations from 1961 through 1969 associate high rates of inflation with low rates of unemployment. In the 1970s, however, after the public had come to anticipate that policy would be stimulative, monetary policy failed to lower the unemployment rate. After 1970,

<sup>13</sup> The quantity theory stresses the relationship between the nominal quantity of money and the nominal, or dollar-denominated, rate of expenditure of the public. (See footnote 5 on the transactions version of the equation of exchange.) A change in the money supply, according to the theory, will produce a change in the price level, that is, a higher rate of nominal, but not real, expenditure. The quantity theory, however, says nothing about the length of time required for a change in the money supply to be fully reflected in a change in the price level. Likewise, in the interval of time before complete adjustment of the price level, it says nothing about how a change in nominal expenditure caused by a change in the money supply is divided between a change in output and in the price level. Current theorizing in the quantity-theory tradition has been directed toward filling these gaps by modeling formally how the public forms its expectations about the future and, in particular, its expectations about the behavior of monetary policy. In such theorizing, the distinction between predictable and unpredictable changes in the money supply is the key distinction for determining whether changes in the money supply are reflected in output, as opposed to price, changes.

high rates of inflation are not associated with low rates of unemployment.

**Summary** Economists in the quantity theory tradition believe that the monetary authority should

concentrate on two objectives, price stability and prevention of monetary disturbances arising from disruptive behavior of the money supply. These objectives, it is contended, can be achieved best by low, steady rates of growth of the money supply.

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